Rec'd ... 20 APR 2001

11. ☐ Attached:

12. ☐ Preliminary Amendment:

13. ☒ Basic U.S. National fee per Rule 492(a)(1)-(4) was previously timely filed.:

14. **Calculation of remaining fees due (if any):** based on amended claim(s) per above item

☐ 12 (above) or item(s) in PAT-112 (filed previously) ☐ 12 ☐ 14 ☐ 17 ☐ 25

15. **CLAIMS FEES** ☐ previously paid ☒ paid herewith as follows:

15A. Small Entity Statement ☐ Herewith ☐ Previously Filed

				Large/Small Entity			Fee Code
16. Total Effective Claims	14	minus 20 =	0	x $18/$9	+0		966/967
17. Independent Claims	2	minus 3 =	0	x $80/$40	+0		964/965
18. If any proper multiple dependent claim (ignore improper) is present,				$270/$135	+0		968/969
19. Filing Declaration late, fee paid ☐ previously ☒ now				$130/$65	+130		154/254
20.					SUBTOTAL	$130	
21. Original due date: May 3, 2001							
22. Petition is hereby made to extend the original due date to cover the date this response is filed for which the requisite fee is attached			(1 mo)	$110/$55 =	+0		115/215
			(2mos)	$390/$195 =			116/216
			(3mos)	$890/$445 =			117/217
			(4mos)	$1390/$695 =			118/218
23. If "non-English" box 3 is X'd, add Rule 17(k) processing fee				$130	+0		156
24. If "assignment" box 6 is X'd, add recording fee.				$40	+40		581
25.			**TOTAL FEE ENCLOSED =**		$170		

(Our Deposit Account No. 03-3975)
(Our Order No. 60258 | 277182
                C#   M#

CHARGE STATEMENT: The Commissioner is hereby authorized to charge any fee specifically authorized hereafter, or any missing or insufficient fee(s) filed, or asserted to be filed, or which should have been filed herewith or concerning any paper filed hereafter, and which may be required under Rules 16-18 (missing or insufficient fee only) now or hereafter relative to this application and the resulting Official document under Rule 20, or credit any overpayment, to our Account/Order Nos. shown above for which purpose a duplicate copy of this sheet is attached.
This CHARGE STATEMENT does not authorize charge of the issue fee until/unless an issue fee transmittal form is filed.

Pillsbury Winthrop LLP
Intellectual Property Group

1100 New York Avenue, NW
Ninth Floor
Washington, DC 20005-3918
Tel: (202) 861-3000
CHM/mhn

By Atty: Christine H. McCarthy   Reg. No. 41844

Sig: _____   Fax: (202) 822-0944
                                  Tel: (202) 861-3075

NOTE: File in **duplicate** with PTO receipt (PAT-103A) and attachments

04/30/2001 MNGUYEN 00000074 09762721

01 FC:154   130.00 OP

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
REQUEST FOR FILING NATIONAL PHASE OF
PCT APPLICATION UNDER 35 U.S.C. 371 AND 37 CFR 1.494 OR 1.495

To: Hon. Commissioner of Patents
Washington, D.C. 20231

00909

TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US)   Atty Dkt: **PM 277182**   /2980353US/VK/KP
                                                            M#   /Client Ref.

Pillsbury Winthrop LLP, IP Group: Date: February 9, 2001

This is a **REQUEST** for **FILING** a PCT/USA National Phase Application based on:

1. International Application	2. International Filing Date	3. Earliest Priority Date Claimed
PCT/FI99/00666	11 August 1999	12 August 1998
⇑ country code	Day MONTH Year	Day MONTH Year
		(use item 2 if no earlier priority)

4.   Measured from the earliest priority date in item 3, this PCT/USA National Phase Application Request is being filed within:

    (a) ☐ 20 months from above item 3 date   (b) ☒ 30 months from above item 3 date,

    (c) Therefore, the due date (<u>unextendable</u>) is   February 12, 2001

5.   Title of Invention <u>METHOD AND EQUIPMENT FOR SETTING A TIMER</u>

6.   Inventor(s)   <u>TIIHONEN, Juha et al</u>

Applicant herewith submits the following under 35 U.S.C. 371 to effect filing:

7.   ☒ Please immediately start national examination procedures (35 U.S.C. 371 (f)).

8.   ☐ **A copy of the International Application** as filed (35 U.S.C. 371(c)(2)) is transmitted herewith (file in if in English but, if in foreign language, file only if <u>not</u> transmitted to PTO by the International Bureau) including:

    a. ☐ Request;
    b. ☐ Abstract;
    c. ___ pgs. Spec. and Claims;
    d. ___ sheet(s) Drawing which are ☐ informal ☐ formal of size ☐ A4 ☐ 11"

9.   ☒ **A copy of the International Application has been transmitted by the International Bureau.**

10.   **A translation of the International Application** into English (35 U.S.C. 371(c)(2))
    a.   ☒   is transmitted herewith including: (1) ☒ Request;   (2) ☒ Abstract;
                 (3)   9   pgs. Spec. and Claims;
                 (4)   1   sheet(s) Drawing which are:
                              ☐ informal ☒ formal of size ☒ A4 ☐ 11"
    b.   ☐   is not required, as the application was filed in English.
    c.   ☐   is not herewith, but <u>will be filed when required</u> by the forthcoming PTO Missing Requirements Notice per Rule 494(c) if box 4(a) is X'd or Rule 495(c) if box 4(b) is X'd.
    d.   ☐   Translation verification attached (not required now).

Document9   PAT-112CN 10/00

RE: USA National Filing of PCT/FI99/00666

24.   Attached: Copy of Finnish OA

25.   **Preliminary Amendment:**   Claim 3, line1, delete " or 2 "
                                      Claim 6, line 1, delete " or 5 "
                                      Claim 7, line 1, change " any one . . . to 6 " to -- claim 4 --

25.5   Per Item 17.c2, **cancel original** pages #___, claims #___, Drawing Sheets #

26.   **Calculation of the U.S. National Fee (35 U.S.C. 371 (c)(1)) and other fees is as follows:**
Based on amended claim(s) per above item(s) ☐ 12, ☐ 14, ☐ 17, ☒ 25, ☐ 25.5 (hilite)

Total Effective Claims	minus 20 =	x $18/$9	= $0	966/967
Independent Claims	minus 3 =	x $80/$40	= $0	964/965
If any proper (ignore improper) Multiple Dependent claim is present,		add$270/$135	+0	968/969

BASIC NATIONAL FEE (37 CFR 1.492(a)(1)-(4)): → → **BASIC FEE REQUIRED, NOW** → → → → ↓

A.   If country code letters in item 1 are **not** "US","BR","BB","TT","MX","IL" "NZ", "IN" or "ZA"   ↓

       See item 16 re: ↓
       1.   Search Report was not prepared by EPO or JPO - - - - - - - - add$1000/$500   960/961
       2.   Search Report was prepared by EPO or JPO - - - - - - - - - - add$860/$430   +1000   970/971

SKIP B, C, D AND E UNLESS country code letters in item 1 are "US","BR","BB","TT","MX","IL", "NZ", "IN" or "ZA"   ↓

→ ☐ B.   If USPTO did not issue both International Search Report
           (ISR) and (if box 4(b) above is X'd) the International   add$970/$485   +0   960/961
           Examination Report (IPER), - - - - - - - - - - - - - - - - -

→ ☐ C.   If USPTO issued ISR but not IPER (or box 4(a) above is
           X'd), -   add$710/$355   +0   958/959

   ☐ D.   If USPTO issued IPER but IPER Sec. V boxes not all 3
           YES, -   add$690/$345   +0   956/957

→ ☐ E.   If international preliminary examination fee was paid to
           USPTO and Rules 492(a)(4) and 496(b) satisfied (IPER   962/963
           Sec. V all 3 boxes YES for all claims), - - - - - - - - - - -   add $100/$50   +0

27.   **SUBTOTAL =** $1000

28.   If Assignment box 19 above is X'd, add Assignment Recording fee of ----$40   +0   (581)

29.   Attached is a check to cover the - **TOTAL FEES** $1000

       Our Deposit Account No. 03-3975
       Our Order No.   60258 | 277182   00909
                        C# | M#

CHARGE STATEMENT: The Commissioner is hereby authorized to charge any fee specifically authorized hereafter, or any missing or insufficient fee(s) filed, or asserted to be filed, or which should have been filed herewith or concerning any paper filed hereafter, and which may be required under Rules 16-18 and 492 (missing or insufficient fee only) now or hereafter relative to this application and the resulting Official document under Rule 20, or credit any overpayment, to our Account/Order Nos. shown above for which purpose a duplicate copy of this sheet is attached.
This CHARGE STATEMENT does not authorize charge of the issue fee until/unless an issue fee transmittal form is filed

                          Pillsbury Winthrop LLP
                          Intellectual Property Group

                          By Atty: Richard C. Irving   Reg. No.   38499

                          Sig: _Richard C. Irving_   Fax: (202) 822-0944
Atty/Sec: RCI/mhn   Tel: (202) 861-3788

            NOTE: File in duplicate with 2 postcard receipts (PAT-103) & attachments.

RE: USA National Fil. of PCT /FI99/00666

11. ☒ **PLEASE AMEND** the specification before its first line by inserting as a separate paragraph:
- a. ☒ --This application is the national phase of international application PCT/FI99/00666 filed ___August 11,___ 1999 which designated the U.S.--
- b. ☐ --This application also claims the benefit of U.S. Provisional Application No. 60/ ___, filed ___.--

12. ☐ Amendments to the claims of the International Application **under PCT Article 19 (35 U.S.C. 371(c)(3)), i.e., before 18th month** from first priority date above in item 3, **are transmitted herewith** (file only if in **English**) including:

13. ☒ PCT Article 19 claim amendments (if any) have been transmitted by the International Bureau

14. ☐ Translation of the amendments to the claims **under PCT Article 19 (35 U.S.C. 371(c)(3)), i.e., of claim amendments** made before 18th month, **is attached (required by 20th month from the date in item 3 if box 4(a) above is X'd, or 30th month if box 4(b) is X'd, or else amendments** will be considered **canceled).**

15. **A declaration of the inventor** (35 U.S.C. 371(c)(4))
- a. ☐ is submitted herewith ☐ Original ☐ Facsimile/Copy
- b. ☒ is not herewith, but will be filed when required by the forthcoming PTO Missing Requirements Notice per Rule 494(c) if box 4(a) is X'd or Rule 495(c) if box 4(b) is X'd.

16. **An International Search Report (ISR):**
- a. Was prepared by ☐ European Patent Office ☐ Japanese Patent Office ☒ Other
- b. ☒ has been transmitted by the International Bureau to PTO.
- c. ☒ copy herewith (2 pg(s).) ☒ plus Annex of family members (1 pg(s).).

17. **International Preliminary Examination Report (IPER):**
- a. ☒ has been transmitted (if this letter is filed after 28 months from date in item 3) in English by the International Bureau with Annexes (if any) in original language.
- b. ☒ copy herewith in English.
- c.1 ☐ IPER Annex(es) in original language ("Annexes" are amendments made to claims/spec/drawings during Examination) including attached amended:
- c.2 ☐ Specification/claim pages #___ claims # Dwg Sheets #
- d. ☐ Translation of Annex(es) to IPER **(required by 30th month due date, or else annexed amendments will be considered canceled).**

18. **Information Disclosure Statement** including:
- a. ☒ Attached Form PTO-1449 listing documents
- b. ☒ Attached copies of documents listed on Form PTO-1449
- c. ☒ A concise explanation of relevance of ISR references is given in the ISR.

19. ☐ **Assignment** document and Cover Sheet for recording are attached. Please mail the recorded assignment document back to the person whose signature, name and address appear at the end of this letter.

20. ☐ Copy of Power to IA agent.

21. ☐ **Drawings** (complete only if 8d or 10a(4) not completed): _ sheet(s) per set: ☐ 1 set informal; ☐ Formal of size ☐ A4 ☐ 11"

22. Small Entity Status ∅ ☒ **is Not** claimed ☐ is claimed **(pre-filing confirmation required)**
22(a) ___ (No.) Small Entity Statement(s) enclosed (since 9/8/00 Small Entity Statements(s) not essential to make claim)

23. **Priority** is hereby claimed under 35 U.S.C. 119/365 based on the priority claim and the certified copy, both filed in the International Application during the international stage based on the filing in (country) FINLAND of:

	Application No.	Filing Date		Application No.	Filing Date
(1)	981738	August 12, 1998	(2)		
(3)			(4)		
(5)			(6)		

- a. ☒ See Form PCT/IB/304 sent to US/DO with copy of priority documents. If copy has not been received, please proceed promptly to obtain same from the IB.
- b. ☐ Copy of Form PCT/IB/304 attached.

METHOD AND EQUIPMENT FOR SETTING A TIMER

BACKGROUND OF THE INVENTION

The invention relates to considering the propagation delay on a data link in a digital mobile communication system. The invention will be de-
5   scribed using primarily the terms of the GSM system, but it can also be ap-
plied to other kind of digital mobile communication systems.

In a data call in a digital mobile communication system, the propa-
gation delay is one of the parameters affecting connection quality. The extent of the propagation delay should affect the choice of system parameters. One
10   such system parameter is the set value of a timer T1 associated with the GSM system RLP protocol (Radio Link Protocol). The timer is defined in the ETSI recommendation GSM 04.22.

Knowing the value of the propagation delay would contribute to the optimization of the timers of protocol software, particularly those of its layer 2.
15   Connection-specific optimization of timer settings improves the reaction speed of protocol software for example in error situations when the integrity of user data has to be fixed by retransmission of either part or all of the frames in a transmission window. (A transmission window is the number of RPL frames the transmitting party can send without receiving acknowledgement from the
20   receiving party.) If the timer is set too long, data transmission slows down, since potential errors are not corrected until the timer has expired. Setting the timer too short, again, results in a much more serious situation, since the transmitting party has to continuously request acknowledgements from the receiving party.

25   The problem is particularly perceivable when a connection includes a portion which causes much propagation delay, a satellite link, for example. In this case data calls may not succeed or the data transfer rate decreases significantly.

Still more significant variations in the propagation delay may occur
30   in inter-BTS handover to a cell whose connection to the mobile switching cen-
tre is implemented via a satellite link. Such a situation is shown in Figure 1, in which the mobile station MS moves along route 1 denoted by a broken line in such a way that the connection is initiated via a base station subsystem BSS1 which has a normal wired connection to the mobile switching centre, or, in
35   short, to the centre, MSC. During the call, inter-BTS handover occurs to a

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base station system BSS2 whose connection to the centre MSC is via a satellite SAT.

BRIEF DESCRIPTION OF THE INVENTION

5 The object of the invention is thus to provide a method and an equipment for implementing the method to solve the above problems associated with variation in the propagation delay. The objects of the invention are achieved by a method and a system which are characterized by what is disclosed in the independent claims. The different embodiments of the invention and the preferred variations thereof are disclosed in the dependent claims.

10 An option would be to improve the tolerance of the system to variations in the propagation delay, for example by increasing the size of the transmission window. However, this would cause the problem of increased data to be retransmitted in error situations.

15 To define a default or initial value for the timer and to have at least one party monitor if the need has arisen to change the timer value, is considered as a better solution. Should such a need be detected, the timer value is set to differ from the default or initial value.

20 The need to change the timer value can be determined in handover, particularly when network structure changes, for example when inter-BTS handover takes place to a cell whose base station is connected to the mobile centre via a satellite link. Instead or in addition, it is also preferable to repeatedly determine the need to change the timer value during the connection. Alternatively or in addition, the need to change the timer value can be detected by an explicit notice, for example by maintaining a table containing cell, loca-
25 tion area or base station controller-specific optimum values for the timer.

In known mobile communication systems, setting the timer value is based on network planning, i.e. the timer value has to be set as low as possible, but nonetheless definitely higher than the highest existent propagation delay value. The improvement brought about by the invention is that the sys-
30 tem operates without such a security margin, thus improving the transfer rate in the system. The invention also allows the use of transmission methods having propagation delays that differ from normal at such interfaces as the A interface between a mobile centre MSC and a base station system BSS.

PRIMARY EMBODIMENT

35 The primary embodiment of the invention is a solution in which set-

ting the timer value comprises measuring the propagation delay associated
with a connection section. A connection refers to an entire end-to-end con-
nection between subscriber A and subscriber B (and/or subscriber C...). A
connection section refers to that section of the connection which has a sepa-
5   rate protocol timer. A typical connection section forms between a mobile
switching centre MSC and a mobile station MS.

Measuring the propagation delay is not a simple solution, since,
unlike in athletic contests, there is no external observer to start the run and
stop the timer as the runner breasts the finishing tape. An option is for the
10 transmitting party to transmit to the receiving party a frame selected and/or
formed in a such a way that the receiving party sends an acknowledgement
thereof. In Figure 1, the frame and the acknowledgement are denoted by ref-
erences F and Ack, respectively. In the example of Figure 1, the mobile
switching centre MSC transmits frame F and the mobile station MS, while
15 within the area of the base station system BSS2, sends acknowledgement
Ack. The transmitting party measures the time that passes from the moment
frame F is transmitted to the arrival of acknowledgement Ack. However, this is
not necessarily exactly the same as the propagation delay used to set the
timer, unless frames formed from user data are used in the measurement.
20 Such frames are not always available, particularly when most needed, i.e.
when the connection is being set up and the timer should be set to a suitable
value. Hereinafter, frames formed from user data are called 'payload frames'
and the frame used for measuring the propagation delay is called 'a meas-
urement frame'. If a measurement frame is not a payload frame, it is called 'a
25 separate measurement frame'. Such separate measurement frames may be
treated differently at the other end of the connection than payload frames, i.e.
they may have a different priority and/or processing time, i.e. the measure-
ment result it not necessarily representative.

User data is sent in I+S frames (Information + Supervisor frame).
30 The use of such frames for measuring the propagation delay is most prefer-
able when there is user data to be sent, since they do not cause extra load to
the network. They do not either cause the problem that frames used for meas-
uring are treated differently at the receiving end than payload frames. As re-
gards I+S frames, it should be noted that one acknowledgement can cover
35 several frames. If several successive I+S frames are transmitted, the acknow-
ledgement of the last one also acknowledges all previous frames. Hence the

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acknowledgement number may shows skips. In this case, a to-and-fro propagation delay is the time between frame F and acknowledgement Ack that have the same number.

I+S frames cannot always be used. They are available only in a
5   data transmission mode when there is user data to be transmitted. In this
case, a Test frame, for example, can be used in the GSM RLP, resulting in a
reliable measurement result without any risk of collision since the receiving
party has to acknowledge each Test frame separately, i.e. transmit a corresponding Test Response frame. The use of the information field in a Test
10   frame allows measurement frames to be numbered and thus the Test Response frame can be used for identifying which measurement frame each acknowledgement is associated with. The problem in a Test frame, as in all
separate measurement frames, is that the transmission and acknowledgement
of extra frames adds to the network load and may slow down data transmis-
15   sion. On the other hand, the moment for using separate measurement frames
is when there is no user data to be transmitted. Another problem in a Test
frame is that the receiving party processes it in a different way than payload
frames, i.e. each Test frame is separately acknowledged, whereby the measurement result may be better than the actual propagation delay experienced
20   by the payload frames. As was stated above, particularly a situation where the
timer setting is lower than the actual propagation delay is to be avoided.

Another potential measurement frame is the RLP protocol SABM
(Set Asynchronous Balanced Mode) which the receiving party acknowledges
by frame UA (Unnumbered Acknowledgement). A mobile station can utilize
25   this frame type efficiently since it usually starts the set-up of a connection section. No extra frames have to be used in the measurement, since an SABM
frame is anyway required after the connection section has been set up. A
problem is that if the interworking function IWF of the mobile switching centre
MSC uses the same pair of frames, this results in double initialization of a
30   connection section, since the mobile station is likely to have set up the connection section. Another problem is that in an RLP 4 mode according to the
ETSI GSM recommendation 4.22, user data may be lost since data buffers are
emptied in re-establishment of a connection section.

A third potential measurement frame is the XID frame which is usu-
35   ally employed in a negotiation associated with connection section set-up. It
can be used any time and its use does not affect data transmission. A problem

is, however, that in XID frame collision, the measurement has to be repeated.

A fourth potential measurement frame is the S frame (supervisor frame). It can be used only in data transmission mode and the use of S frames may slow down data transmission. On the other hand, S frames (unlike I+S frames) can be used even when there is no user data to be transmitted.

SECONDARY EMBODIMENT

A secondary embodiment of the invention is a solution in which the start of a connection and/or a change in network structure, such as in inter-BTS handover, is explicitly informed to the protocol layer that sets the timers. If at the start of a call the connection BSC/MSC is a conventional land connection, the MSC/IWF timers are initiated to one second, for example. If again the connection BSC/MSC is implemented via a satellite, the timers are initiated to higher value, for example 2 seconds. The same deduction is made when the network structure changes, such as in inter-BTS handover. However, this requires major changes in the present GSM system and is feasible mainly in future systems or as a proprietary expansion of present systems.

A way to implement this is via a separate satellite connection indicator. When setting up a connection section (at the start of a call or in handover), the MSC receives information stating that a new connection section is being set up via a satellite, whereby the MSC call control software initiates the IWF protocol software in a corresponding manner. In this case, the satellite connection indicator is mainly an on/off indicator merely indicating that the propagation delay is longer than usual.

Another way is for the MSC call control software to identify delay requirements in call set-up and/or handover on the basis of the route used on the connection section and to notify to the IWF protocol software the special requirements of the route used as regards the tolerance to propagation delay. This method enables the use of several different delay requirement classes, i.e. the tolerance to the propagation delay may be set connection-specifically.

A third way is to identify the delay requirement on the basis of the location area identity, or the like, of the mobile station. In this case the mobile centre must comprise or have access to a table in which the propagation delay is defined cell or location area-specifically.

The embodiments may also be used together in such a way that the initial timer value is determined on the basis of connection type and/or loca-

tion area on the basis of the secondary embodiment, but the timer value is adjusted later during the connection on the basis of the primary embodiment.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will be described in greater detail in connection with
5 preferred embodiments with reference to the attached drawings, of which

Figure 1 shows the parts of a digital mobile communication system that are essential to understanding the invention;

Figure 2 shows the effect of timer setting on channel transfer rate; and

10   Figure 3 illustrates adjustment of timer setting.

DETAILED DESCRIPTION OF THE INVENTION

Figure 2 is a diagram showing the effect of timer setting S on the transfer rate TR of the channel involved. The transfer rate TR is at its highest when the timer setting S corresponds to the actual propagation delay D. If the
15 timer setting S is higher than the propagation delay D, the damage is not that significant, since problems arise only when information on error situations is received only after the timer has expired. If again the timer setting S is lower than the actual propagation delay D, the situation is very bad since the transmission of each frame causes the timer to trigger off, and the transmitting
20 party has to retransmit the frames and/or request for a new acknowledgement. In Figure 2 the assumption is that in such an error situation the value of the timer is increased. In a prior art system in which the timer setting is fixed, the transfer rate would immediately fall to zero in such a situation, since no acknowledgement is received for retransmitted frames before the timer has triggered
25 ered off. Finally the connection would break up as a result of an alarm caused by a timer which counts renewed attempts.

Timer setting during a connection is preferably implemented by the method shown in Figure 3. At the start of a connection, the timer is set to an empirical value S_0, which definitely is sufficient. The propagation delay is then
30 measured repeatedly during the connection, and the timer value is decreased by step dS_1 if the propagation delay D is lower than the timer value S. At time T_A it is observed that the timer value S is lower than the propagation delay D. This could result from a measurement error, random variation or the load on the second party to the connection having increased to the extent that its
35 processing time has increased. Such a situation can be detected either by

measuring the propagation delay or by detecting that the number of retransmissions is rapidly increasing. The timer value S is now increased by step dS_2, which is substantially higher than the difference between the measured propagation delay D and the current timer value S. In this context "substan-
5   tially higher" means that the timer setting is increased to a value which is definitely higher than the propagation delay D. Thereupon, when it is observed that the timer value can be decreased, it is again decreased by step dS_1, which is clearly lower than the difference between the measured propagation delay D and the current timer setting S.

10   Figure 1 shows a data base, or table DB, which is one way to implement the secondary embodiment of the invention. Figure 1 shows three cells C1 to C3, of which C1 belongs to location area LA1 and C2 and C3 to location area LA2. The database DB may contain a suitable cell, location area and/or base station controller-specific timer value S (in milliseconds in this
15   case).

          The invention can be best implemented in a mobile station MS and a mobile switching centre MSC. In the case of a mobile switching centre, it is preferable to implement the function of the invention also in what are known as anchor centre connections. An anchor centre is the MSC in which the call
20   interworking function IWF is located when a call has moved to the control of another centre as a result of inter-MSC handover.

          The invention has been described using the terms of the GSM system, but it is also applicable in other systems, such as the GSM evolution, UMTS, etc. Accordingly, the invention and its embodiments are not restricted
25   to the above examples but may vary within the scope of the claims.

CLAIMS

1. A method of setting a timer associated with a protocol supporting a data link in a digital mobile communication system in a connection section comprising a transmitting party and a receiving party, in which method an initial value (S_0) has been defined for the timer,

c h a r a c t e r i z e d by

at least one of the parties monitoring if the need to change the timer value has arisen;

setting the timer value (S) to a value deviating from the initial value (S_0), should such a need be detected.

2. A method as claimed in claim 1, **c h a r a c t e r i z e d** by said need to change the timer value (S) being determined also during a connection, such as in handover.

3. A method as claimed in claim 1 or 2, **c h a r a c t e r i z e d** by said need to change the timer value (S) being determined repeatedly during a connection.

4. A method as claimed in any one of the preceding claims, **c h a r a c t e r i z e d** by said setting of the timer value (S) comprising the measurement of the propagation delay (D) associated with the connection section.

5. A method as claimed in claim 4, **c h a r a c t e r i z e d** in that should the need to decrease the timer value (S) be detected, the timer value is decreased by a first step (dS_1) which is substantially lower than the difference between the measured propagation delay (D) and the current timer value (S).

6. A method as claimed in claim 4 or 5, **c h a r a c t e r i z e d** in that should the need to increase the timer value (S) be detected, the timer value is increased by a second step (dS_2) which is substantially higher than the difference between the measured propagation delay (D) and the current timer value (S).

7. A method as claimed in any one of claims 4 to 6, **c h a r a c - t e r i z e d** by said measurement of the propagation delay (D) comprising the steps of:

either party to the connection transmitting to the other party a frame (F) which is selected/formed such that the party receiving the frame sends an acknowledgement (Ack) to the transmitting party; and

the party which transmitted the frame measuring the time from the moment of transmission of the frame (F) to the arrival of the acknowledgement (Ack) and deducing the propagation delay (D) therefrom.

8. A method as claimed in claim 1, **c h a r a c t e r i z e d** by said need to change the timer value being detected from a separate parameter which is read from a database or received from the other party to the connection section at the start of the connection and/or when connection quality changes, such as in handover.

9. A method as claimed in claim 8, **c h a r a c t e r i z e d** by said parameter indicating if the connection section is set up via a satellite or not.

10. A method as claimed in claim 1, **c h a r a c t e r i z e d** by said need to change the timer value being detected on the basis of the location of the mobile station.

11. An equipment (MSC/IWF, MS) for setting a timer associated with a protocol supporting a data link in a digital mobile communication system in a connection section whose first party is said equipment (MSC/IWF, MS) and which also comprises a second party (MS, MSC/IWF)

the equipment being adapted to set a predetermined initial value (S_0) to the timer,

c h a r a c t e r i z e d by

at least one party being adapted to monitor if the need to change the current timer value (S) has arisen;

the equipment being adapted to set the current timer value to a value deviating from the initial value (S_0), should such a need be detected.

12. An equipment as claimed in claim 11, **c h a r a c t e r i z e d** by being a mobile switching centre (MSC(IWF).

13. An equipment as claimed in claim 12, **c h a r a c t e r i z e d** by comprising or having associated with it a data base (DB) comprising a plurality of different cell, location area and/or base station controller-specific timer values (S).

14. An equipment as claimed in claim 11, **c h a r a c t e r i z e d** by being a mobile station (MS).
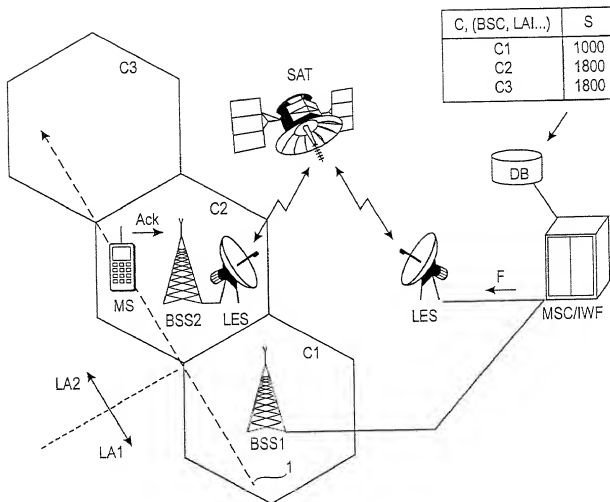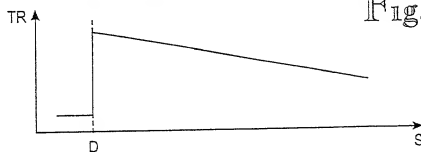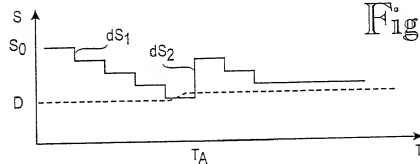
1/1

Fig. 1

C, (BSC, LAI...)	S
C1	1000
C2	1800
C3	1800

Fig. 2

Fig. 3

As a below named inventor, I hereby declare that my residence, post office address and citizenship are as stated below next to my name, and I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the **INVENTION ENTITLED** **_____ METHOD AND EQUIPMENT FOR SETTING A TIMER**

the specification of which (CHECK applicable BOX(ES))

X   A. ☐ is attached hereto.

BOX(ES)   B. ☐ was filed on _____ as U.S. Application No. _____ / _____

➔   C. X was filed as PCT International Application No. PCT/FI99 /00666 on 11 August 1999

and (if applicable to U.S. or PCT application) was amended on _____

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above. I acknowledge the duty to disclose all information known to me to be material to patentability as defined in 37 C F R 1 56 Except as noted below, I hereby claim foreign priority benefits under 35 U S C 119(a)-(d) or 365(b) of any foreign application(s) for patent or inventor's certificate, or 365(a) of any PCT International Application which designated at least one other country than the United States, listed below and have also identified below any foreign application for patent or inventor's certificate, or PCT International Application, filed by me or my assignee disclosing the subject matter claimed in this application and having a filing date (1) before that of the application on which priority is claimed, or (2) if no priority claimed, before the filing date of this application

PRIOR FOREIGN APPLICATION(S)

Number	Country	Day/MONTH/Year Filed	Date first Laid-open or Published	Date Patented or Granted	Priority NOT Claimed
981738	Finland	12 August 1998			

If more prior foreign applications, X box at *bottom* and continue on attached page.

Except as noted below, I hereby claim domestic priority benefit under 35 U S C 119(e) or 120 and/or 365(c) of the indicated United States applications listed below and PCT International applications listed above or below and, if this is a continuation-in-part (CIP) application, insofar as the subject matter disclosed and claimed in this application is in addition to that disclosed in such prior applications, I acknowledge the duty to disclose all information known to me to be material to patentability as defined in 37 C.F.R. 1.56 which became available between the filing date of each such prior application and the national or PCT international filing date of this application:

PRIOR U.S. PROVISIONAL, NONPROVISIONAL AND/OR PCT APPLICATION(S)   **Status**   **Priority NOT Claimed**

Application No. (series code/serial no.)   Day/MONTH/Year Filed   pending, abandoned, patented

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true, and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

And I hereby appoint Pillsbury Winthrop LLP, Intellectual Property Group, 1100 New York Avenue, N W, Ninth Floor, East Tower, Washington, D C 20005-3918, telephone number (202) 861-3000 (to whom all communications are to be directed), and the below-named persons (of the same address) individually and collectively my attorneys to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith and with the resulting patent, and I hereby authorize them to delete names/numbers below of persons no longer with their firm and to act and rely on instructions from and communicate directly with the person/assignee/attorney/firm/ organization who/which first sends/sent this case to them and by whom/which I hereby declare that I have consented after full disclosure to be represented unless/until I instruct the above Firm and/or a below attorney in writing to the contrary

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"X" box X **FOR ADDITIONAL INVENTORS**, and proceed on the attached page to list each additional inventor.

☐ See additional foreign priorities on attached page (incorporated herein by reference).

DECLARATION AND POWER OF ATTORNEY
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